Forest Site Management Section
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November 3, 1998

SILVICULTURE NOTE 17

EFFECT OF SITE PREPARATION ON GROWTH INTERCEPT ESTIMATES OF SITE INDEX

1997 RESULTS FROM THE BEDNESTI SITE PREPARATION TRIAL

Background

In British Columbia, the growth intercept (GI) method is widely used to estimate site index in young stands. To produce accurate site index estimates with the GI method, today's young stands must have the same patterns of top height growth as the natural stands that were sampled to construct the GI model. Why? Because the top height growth patterns observed in select natural stands have been used to develop the GI predictions of site index. Top height at age 50 (site index) may differ, but the shape of top height growth curves in your stand must match the shape of top height growth curves in the stands that were used to construct the model. If harvesting, site preparation, or treatment alter top height growth patterns, biased site index estimates could be produced when the growth intercept method is applied to those stands. Figure 1 provides one hypothetical example of treatment affecting top height and the associated impact on GI-based site index predictions.

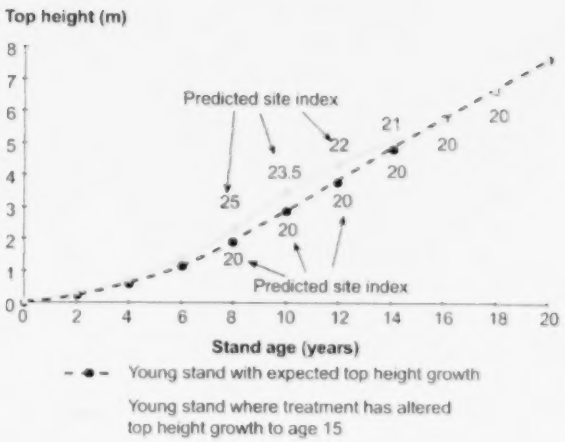

Figure 1. Hypothetical example of the impact on GI-based site index predictions when silviculture treatment causes a short-term modification of top height growth.

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The Bednesti Site Preparation Trial

The Bednesti site preparation trial provides an excellent opportunity to assess the stability of GI-based estimates of site index across a range of site preparation treatments. This study has a randomized block design with five blocks and 10 treatment plots per block. Each plot was either untreated or received one of nine site preparation treatments before planting with lodgepole pine in 1988. Forty-eight trees were planted in each treatment plot. The height of each tree was measured each year from 1988 to 1997. With this valuable data we can observe the extent to which treatment has influenced the site index predictions of the GI method.

Results

At Bednesti, site preparation appears to increase height growth. For example, in 1997, the average tree in the burned windrow was 36% taller than the average tree in the non-prepared area (Table 1). However, the site index predicted by the GI method differed by only 3%.

The GI method appears surprisingly robust. While average heights in the treatments vary from 89–137% of the average height in the control, predicted site index only varies from 97–106% of the control (Figure 2).

Table 1. Site index and average height by treatment in 1997

Site preparation treatment	Site index (m)[a]	Average height (cm)
Untreated	21.1	293.1
Bedding plow	22.2	379.0
Bräcke mineral mound	21.5	319.0
Bräcke patch shoulder	21.7	319.2
Breaking plow	21.6	351.7
Burn windrow	21.8	400.3
Delta berm hinge	21.8	353.5
Delta furrow	20.4	259.9
Madge	22.3	390.0
Waddell hinge	21.9	352.0

[a] Source: Lodgepole pine model in B.C. 1995. Growth intercept models and tables for British Columbia - Interior species. B.C. Min. For., Victoria, B.C. Land Manage. Handb. Field Guide Insert 10.

The discrepancy between the effect of site preparation on average height and its effect on predicted site index is due to site preparation greatly accelerating growth below breast height, while the annual height growth of top height trees above breast height is relatively unaffected by site preparation (Table 2 and Figure 2).

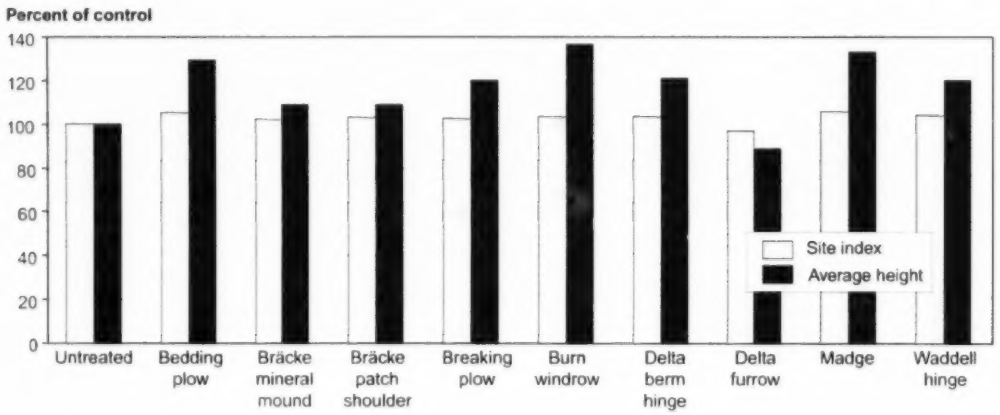

Figure 2. 1997 average height and site index expressed as percent of control value.

Table 2. Top height at three years breast height age by treatment

Site preparation treatment	Top height (cm)
Untreated	254.5
Bedding plow	273.9
Bracke mineral mound	260.0
Bracke patch shoulder	259.0
Breaking plow	254.5
Burn Windrow	262.5
Delta berm hinge	254.6
Delta furrow	239.1
Madge	271.4
Waddell hinge	258.5

Implications

If harvesting, regeneration, or treatment alter the top height growth patterns of young stands relative to those observed in older stands, the site index estimates produced by the GI method may be inaccurate. This could have a significant effect on important projects, such as the Old-growth Site Index (OGSI) project, that rely on the GI method to provide estimates of site index. The Bednesti results suggest that the lodgepole pine GI is quite robust over a range of site preparation treatments.

Limitations

The results to date suggest that site preparation is not affecting GI-based site index predictions at Bednesti. However, since the Bednesti trial is only 10 years old, this analysis can provide no more than weak evidence of the stability of GI-based site index predictions. This trial will have to be remeasured for many more years before we can confirm the early results reported in this leaflet.

For more information:

For more information on the Bednesti site preparation trial, contact:

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